



DEPARTMENT OF ENERGY

[Case Number 2019-009; EERE-2019-BT-WAV-0028]

Energy Conservation Program: Notification of Petition for Waiver of CellarPro from the Department of Energy Walk-in Coolers and Walk-in Freezers Test Procedure and Notification of Grant of Interim Waiver

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Notification of petition for waiver and grant of an interim waiver; request for comments.

SUMMARY: This document announces receipt of and publishes a petition for waiver and interim waiver from CellarPro, which seeks a waiver for specified walk-in cooler refrigeration system basic models from the U.S. Department of Energy (“DOE”) test procedure used to determine the efficiency and energy consumption of walk-in coolers and walk-in freezers. DOE also gives notice of an Interim Waiver Order that requires CellarPro to test and rate the specified walk-in cooler refrigeration system basic models in accordance with the alternate test procedure set forth in the Interim Waiver Order, which modifies the alternate test procedure suggested by CellarPro. DOE solicits comments, data, and information concerning CellarPro’s petition, its suggested alternate test procedure, and the alternate test procedure specified in the Interim Waiver Order so as to inform DOE’s final decision on CellarPro’s waiver request.

DATES: The Interim Waiver Order is effective on [INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]. Written comments and information will be accepted on or before [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at <http://www.regulations.gov>. Alternatively, interested persons may submit comments, identified by case number “2019-009”, and Docket number “EERE-2019-BT-WAV-0028,” by any of the following methods:

- *Federal eRulemaking Portal:* <http://www.regulations.gov>. Follow the instructions for submitting comments.
- *E-mail:* CellarPro2019WAV0028@ee.doe.gov. Include Case No. 2019-009 in the subject line of the message.
- *Postal Mail:* Appliance and Equipment Standards Program, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, Mail Stop EE-5B, Petition for Waiver Case No. 2019-009, 1000 Independence Avenue, SW., Washington, DC 20585-0121. If possible, please submit all items on a compact disc (“CD”), in which case it is not necessary to include printed copies.
- *Hand Delivery/Courier:* Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L’Enfant Plaza, SW., 6th floor, Washington, DC, 20024. Telephone: (202) 287-1445. If possible, please submit all items on a “CD”, in which case it is not necessary to include printed copies.

No telefacsimilies (“faxes”) will be accepted. For detailed instructions on submitting comments and additional information on this process, see the “**SUPPLEMENTARY INFORMATION**” section of this document.

Docket: The docket, which includes *Federal Register* notices, comments, and other supporting documents/materials, is available for review at <http://www.regulations.gov>. All documents in the docket are listed in the <http://www.regulations.gov> index. However, some

documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket web page can be found at <https://www.regulations.gov/docket?D=EERE-2019-BT-WAV-0028>. The docket web page contains instruction on how to access all documents, including public comments, in the docket. See the “**SUPPLEMENTARY INFORMATION**” section for information on how to submit comments through <http://www.regulations.gov>.

FOR FURTHER INFORMATION CONTACT: Ms. Lucy deButts, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC 20585-0121. E-mail: AS_Waiver_Request@ee.doe.gov.

Mr. Michael Kido, U.S. Department of Energy, Office of the General Counsel, Mail Stop GC-33, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585-0103. Telephone: (202) 586-8145. E-mail: Michael.Kido@hq.doe.gov.

SUPPLEMENTARY INFORMATION: DOE is publishing CellarPro’s petition for waiver in its entirety in appendix 1 to this document, pursuant to 10 CFR 431.401(b)(1)(iv)¹. DOE invites all interested parties to submit in writing by **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**, comments and information on all aspects of the petition, including the alternate test procedure. Pursuant to 10 CFR 431.401(d), any person submitting written comments to DOE must also send a copy of such comments to the petitioner. The contact information for the petitioner is: Keith Sedwick, keith@cellarprocoolingsystems.com, 1445 N. McDowell Blvd. Petaluma, CA 94954.

¹ The petition did not identify any of the information contained therein as confidential business information.

Submitting comments via <http://www.regulations.gov>. The <http://www.regulations.gov> web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. If this instruction is followed, persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to <http://www.regulations.gov> information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (“CBI”)). Comments submitted through <http://www.regulations.gov> cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through <http://www.regulations.gov> before posting. Normally, comments will be posted within a few days of being submitted. However, if large

volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that <http://www.regulations.gov> provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or postal mail. Comments and documents submitted via email, hand delivery/courier, or postal mail also will be posted to <http://www.regulations.gov>. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. If you submit via postal mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case it is not necessary to submit printed copies. Faxes will not be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English and free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a

list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. According to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

Interim Waiver Order

I. Background and Authority

The Energy Policy and Conservation Act, as amended (“EPCA”),² authorizes the U.S. Department of Energy (“DOE”) to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part C³ of EPCA, added by the National Energy Conservation Policy Act, Public Law 95-619, sec. 441 (Nov. 9, 1978), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve the energy efficiency for certain types of industrial equipment. Through amendments brought about by the Energy Independence and Security Act of 2007, Pub. L. 110-140, sec. 312 (Dec. 19, 2007), this equipment includes walk-in coolers and walk-in freezers, the subject of this Interim Waiver Order. (42 U.S.C. 6311(1)(G))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA include definitions (42 U.S.C. 6311), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), energy conservation standards (42 U.S.C. 6313), and the authority to require information and reports from manufacturers (42 U.S.C. 6316)

The Federal testing requirements consist of test procedures that manufacturers of covered equipment must use as the basis for: (1) certifying to DOE that their equipment complies with

² All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Public Law 116-260 (Dec. 27, 2020).

³ For editorial reasons, upon codification in the U.S. Code, Part C was redesignated as Part A-1.

the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6316(a); 42 U.S.C. 6295(s)), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). Similarly, DOE must use these test procedures to determine whether the equipment complies with relevant standards promulgated under EPCA. (42 U.S.C. 6316(a); 42 U.S.C. 6295(s))

Under 42 U.S.C. 6314, EPCA sets forth the criteria and procedures DOE is required to follow when prescribing or amending test procedures for covered equipment. EPCA requires that any test procedures prescribed or amended under this section must be reasonably designed to produce test results which reflect the energy efficiency, energy use or estimated annual operating cost of covered products and equipment during a representative average use cycle and requires that test procedures not be unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)) The test procedure used to determine the net capacity and annual walk-in energy factor (“AWEF”) of walk-in cooler and walk-in freezer refrigeration systems is contained in the Code of Federal Regulations (“CFR”) at 10 CFR part 431, subpart R, appendix C, *Uniform Test Method for the Measurement of Net Capacity and AWEF of Walk-in Cooler and Walk-in Freezer Refrigeration Systems* (“Appendix C”).

Under 10 CFR 431.401, any interested person may submit a petition for waiver from DOE’s test procedure requirements. DOE will grant a waiver from the test procedure requirements if DOE determines either that the basic model for which the waiver was requested contains a design characteristic that prevents testing of the basic model according to the prescribed test procedures, or that the prescribed test procedures evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data. *See* 10 CFR 431.401(f)(2). A petitioner must include in its petition any alternate test procedures known to the petitioner to evaluate the performance of

the equipment type in a manner representative of its energy consumption characteristics of the basic model. *See* 10 CFR 431.401(b)(1)(iii). DOE may grant the waiver subject to conditions, including adherence to alternate test procedures. *See* 10 CFR 431.401(f)(2).

As soon as practicable after the granting of any waiver, DOE will publish in the *Federal Register* a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. *See* 10 CFR 431.401(1). As soon thereafter as practicable, DOE will publish in the *Federal Register* a final rule to that effect. *Id.*

The waiver process also provides that DOE may grant an interim waiver if it appears likely that the underlying petition for waiver will be granted and/or if DOE determines that it would be desirable for public policy reasons to grant immediate relief pending a determination on the underlying petition for waiver. *See* 10 CFR 431.401(e)(2). Within one year of issuance of an interim waiver, DOE will either: (i) publish in the *Federal Register* a determination on the petition for waiver; or (ii) publish in the *Federal Register* a new or amended test procedure that addresses the issues presented in the waiver. *See* 10 CFR 431.401(h)(1).

When DOE amends the test procedure to address the issues presented in a waiver, the waiver will automatically terminate on the date on which use of that test procedure is required to demonstrate compliance. *See* 10 CFR 431.401(h)(2).

II. CellarPro's Petition for Waiver and Application for Interim Waiver

DOE received a petition from CellarPro dated September 13, 2019 seeking an interim waiver from the test procedure for walk-in cooler and walk-in freezer refrigeration systems set

forth at Appendix C (CellarPro, No. 1 at p. 1⁴). The waiver process under 10 CFR 431.401 requires that a petitioner must request a waiver for there to be consideration of a petition for an interim waiver. CellarPro later confirmed in a May 22, 2020 email that its petition should also be considered as a petition for waiver (CellarPro, No. 4).

The primary assertion in the petition, absent an interim waiver, is that the prescribed test procedure would evaluate the specified basic models in a manner so unrepresentative of their true energy consumption as to provide materially inaccurate comparative data. As presented in CellarPro's petition, the specified basic models of walk-in cooler refrigeration systems operate at a temperature range of 45-65 °F; higher than that of a typical walk-in cooler refrigeration system. Thus, the 35 °F temperature specified in the DOE test procedure for medium-temperature walk-in refrigeration systems would result in the prescribed test procedures evaluating the specified basic models in a manner so unrepresentative of their true energy consumption characteristics as to provide materially inaccurate comparative data. CellarPro also states that the specified basic models are "wine cellar cooling systems" that operate at temperature and relative humidity ranges optimized for the long-term storage of wine and are usually located in air-conditioned spaces. CellarPro contends that because of these characteristics, wine cellar walk-in refrigeration systems differ in their walk-in box temperature setpoint, walk-in box relative humidity, low/high load split,⁵ and compressor efficiency from other walk-in cooler refrigeration systems.

⁴ A notation in the form "CellarPro, No. 1" identifies a written submission: (1) made by CellarPro; and (2) recorded in document number 1 that is filed in the docket of this petition for waiver (Docket No. EERE-2019-BT-WAV-0028) and available at <http://www.regulations.gov>.

⁵ The DOE test procedure incorporates by reference Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") Test Standard 1250-2009, "Standard for Performance Rating of Walk-in Coolers and Freezers" (including Errata sheet dated December 2015) ("AHRI 1250-2009"). Section 6 of that standard defines walk-in box thermal loads as a function of refrigeration system net capacity for both high-load and low-load periods. The waiver petition asserts that wine cellars do not have distinct high and low load periods, and that the box load levels in the test standard are not representative for wine cellar refrigeration systems.

CellarPro states that the specified basic models are designed to provide a cold environment at a temperature range between 45-65 °F with 50-70 percent relative humidity (“RH”), and typically are kept at 55 °F rather than the 35 °F and <50 percent RH test condition prescribed by the DOE test procedure. CellarPro states that the refrigeration systems are designed solely for the purpose of long-term cooling and storage of wine. CellarPro also asserts that operating a wine cellar at the 35 °F condition would adversely mechanically alter the intended performance of the system, which would include icing of the evaporator coil that could potentially damage the compressor, and would not result in an accurate representation of the performance of the cooling unit.

Additionally, a number of the basic models of walk-in refrigeration systems identified in CellarPro’s waiver petition are "self-contained" or single-package systems. In its request for waiver, CellarPro states that these systems have a small footprint and that testing these systems using the refrigerant enthalpy method in AHRI 1250-2009 is complex since mass flow meters would need to be installed in parts of the system with minimal space. DOE recognizes that because of their single-package design, these basic models have insufficient space within the units and insufficient lengths of liquid line and evaporator outlet line for the dual mass flow meters and the dual temperature and pressure measurements required by the test procedure’s refrigerant enthalpy method. As noted by CellarPro, AHRI 1250-2009 does not include specific provisions for testing single-package systems and testing these basic models using the refrigerant enthalpy method as required by Appendix C would require extensive additional piping to route the pipes out of the system where the components can be installed, and then to route them back in to enable the system to operate during testing.⁶ This additional piping would impact unit

⁶ In a waiver granted to Store It Cold for certain models of single-package units, DOE acknowledged a similar issue in which the additional piping necessary to install the required testing components would affect performance of the units, rendering the results unrepresentative. See 84 FR 39286 (Aug. 9, 2019). In the case of the waiver granted to Store It Cold, the refrigerant enthalpy method yielded inaccurate data for the specified basic models compared to the basic models’ true performance characteristics because of the additional piping required to attach the testing

performance, likely be inconsistent between test labs, and result in unrepresentative test values for the unit under test. AHRI has published a revised version of the test standard that provides provisions for single-package systems without requiring extensive additional piping (AHRI 1250-2020, *2020 Standard for Performance Rating of Walk-in Coolers and Freezers*). As discussed below, the interim waiver alternative test procedure presented for comment in this notification adopts the new test methods included in AHRI 1250-2020 for single-package units.

DOE has received multiple waiver and interim waiver requests from wine cellar manufacturers regarding the limitations of Appendix C. In light of these requests, DOE met with the AHRI and wine cellar walk-in refrigeration system manufacturers to develop a consistent and representative alternate test procedure that would be relevant to each waiver request. Ultimately, AHRI sent a letter to DOE on August 18, 2020, summarizing the industry's position on several issues ("AHRI August 2020 Letter").⁷ This letter documents industry support for specific wine cellar walk-in refrigeration system test procedure requirements, allowing the provisions to apply only to refrigeration systems with a minimum operating temperature of 45 °F, since wine cellar system controls and unit design specifications prevent these walk-ins from reaching a temperature below 45 °F. A provision for testing walk-in wine cellar refrigeration systems at an external static pressure ("ESP")⁸ of 50 percent of the maximum ESP to be specified by manufacturers for each basic model (AHRI August 2020 Letter) is also included.

Accordingly, CellarPro submitted an updated petition for waiver and interim waiver on October 2, 2020 (CellarPro, No. 6). The updated petition states that all basic models listed in the

components required by the refrigerant enthalpy test. The same issues are present for the specified single package system basic models included in CellarPro's waiver petition.

⁷ DOE's meetings with CellarPro and other wine cellar refrigeration systems were conducted consistent with the Department's *ex parte* meeting guidance (74 FR 52795; October 14, 2009). The AHRI August 2020 letter memorializes this communication and is provided in Docket No. EERE-2019-BT-WAV-0028-0005.

⁸ External static pressure is the sum of all the pressure resisting the fans. Here, this is chiefly the resistance generated by the air moving through ductwork.

petition for waiver and interim waiver have a minimum operating temperature of 45 °F and provides maximum ESP values for specified ducted self-contained and ducted split system basic models.

CellarPro requests an interim waiver from the existing DOE test procedure. DOE will grant an interim waiver if it appears likely that the petition for waiver will be granted, and/or if DOE determines that it would be desirable for public policy reasons to grant immediate relief pending a determination of the petition for waiver. See 10 CFR 431.401(e)(2).

III. Requested Alternate Test Procedure

EPCA requires that manufacturers use the applicable DOE test procedures when making representations about the energy consumption and energy consumption costs of covered equipment. (42 U.S.C. 6314(d)). Consistency is important when making representations about the energy efficiency of products and equipment, including when demonstrating compliance with applicable DOE energy conservation standards. Pursuant to its regulations at 10 CFR 431.401, and after consideration of public comments on the petition, DOE may establish in a subsequent Decision and Order an alternate test procedure for the basic models addressed by the Interim Waiver Order.

CellarPro seeks to use an approach that would test and rate specific wine cellar walk-in refrigeration system basic models. The company's suggested approach specifies using an air-return temperature of 55 °F, as opposed to the 35 °F requirement prescribed in the current DOE test procedure. CellarPro does not specify air return relative humidity in their petition, though they do state that the subject basic models are designed to maintain relative humidity between 50 and 70 percent. Additionally, CellarPro requests that a correction factor of 0.55 be applied to the final AWEF calculation to account for the different use and load patterns of the specified basic

models as compared to walk-in cooler refrigeration systems generally. CellarPro cited the use of such a correction factor for coolers⁹ and combination cooler refrigeration products under DOE's test procedure for miscellaneous refrigeration products at 10 CFR part 430, subpart B, appendix A.

IV. Interim Waiver Order

DOE has reviewed CellarPro's application, its suggested testing approach, representations of the specified basic models on the website for the CellarPro brand, related product catalogs, and information provided by CellarPro and other wine cellar walk-in refrigeration system manufacturers in meetings with DOE. Based on this review, DOE is granting an interim waiver that requires testing with a modified version of the testing approach suggested by CellarPro.

The modified testing approach would apply to the models specified in CellarPro's waiver petition that include two categories of WICF refrigeration systems, *i.e.*, single package and split (matched) systems. The first 17 basic models listed in CellarPro's table (1800QTL through 8200VS) are single-package systems. All of the single package basic models can be installed either through the wall of a wine cellar or on top of a wine cellar, and the VS series basic models can additionally be ducted to the wine cellar. The ducted configuration is designed to be installed remotely from the wine cellar and provide cooling by circulating air through ducts from the wine cellar to the unit and back. The remaining basic models (3000S through AH24Sx) are split (matched) systems, in which refrigerant circulates between the "evaporator unit" (unit cooler) portion of the unit and the "condensing unit." The refrigerant cools the wine cellar air in

⁹ A *cooler* is a cabinet, used with one or more doors, that has a source of refrigeration capable of operating on single-phase, alternating current and is capable of maintaining compartment temperatures either: (1) No lower than 39 °F (3.9 °C); or (2) In a range that extends no lower than 37 °F (2.8 °C) but at least as high as 60 °F (15.6 °C). 10 CFR 430.2.

the evaporator unit, while the condensing unit rejects heat from the refrigeration system in a remote location, often outside. The evaporator coil of the ducted split (matched) system circulates air through ducts from the wine cellar to the evaporator coil and back to provide cooling, while the evaporator coil of the ductless split (matched) systems is installed either partially or entirely in the wine cellar, allowing direct cooling. The capacity range of the specified basic models is from 1,065 Btu/h to 17,500 Btu/h for the specified operating conditions for each of the models (CellarPro, No.8).¹⁰

DOE considers the operating temperature range of the specified basic models to be integral to its analysis of whether such models require a test procedure waiver. Grant of the interim waiver and its alternative test procedure to CellarPro for the specified basic models listed in the petition is based upon CellarPro's representation that the operating range for the basic models listed in the interim waiver does not extend below 45 °F.

The alternate test procedure specified in the Interim Waiver Order requires testing the specified basic models according to Appendix C with the following changes. The required alternate test procedure specifies an air entering dry-bulb temperature of 55 °F and a relative humidity of 55 percent. The alternate test procedure also specifies that the capacity measurement for the specified basic models that are single-package systems (17 basic models 1800QTL through 8200VS) be conducted using a primary and a secondary capacity measurement method as specified in AHRI 1250-2020, using two of the following: The indoor air enthalpy method; the outdoor air enthalpy method; the compressor calibration method; the indoor room calorimeter method; the outdoor room calorimeter method; or the balanced ambient room calorimeter method.

¹⁰ The specified operating temperatures are 55 °F cold-side air entering and 85 °F warm-side air entering. Capacities at specified operating conditions are included in the "2020 CellarPro Product Performance List" provided in docket No. EERE-2019-BT-WAV-0028.

The required alternate test procedure also includes the following additional modifications to CellarPro's suggested approach: For systems that can be installed with (1) ducted evaporator air, (2) with or without ducted evaporator air, (3) ducted condenser air, or (4) with or without ducted condenser air, testing would be conducted at 50 percent of the maximum ESP, consistent with the AHRI August 2020 Letter recommendations, subject to a tolerance of -0.00/+0.05 in. wc.¹¹ DOE understands that maximum ESP is generally not published in available literature such as installation instructions, but manufacturers do generally specify the size and maximum length of ductwork that is acceptable for any given unit in such literature. The duct specifications determine what ESP would be imposed on the unit in field operation.¹² The provision of allowable duct dimensions is more convenient for installers than maximum ESP, since it relieves the installer from having to perform duct pressure drop calculations to determine ESP. DOE independently calculated the maximum pressure drop over a range of common duct roughness values¹³ using duct lengths and diameters published in CellarPro's installation manuals (CellarPro, No. 11). DOE's calculations show reasonable agreement with the maximum ESP values provided by CellarPro for the specified basic models. Given that the number and degree of duct bends and duct type will vary by installation, DOE found the maximum ESP values provided by CellarPro to be sufficiently representative.

Selection of a representative ESP equal to half the maximum ESP is based on the expectation that most installations will require less than the maximum allowable duct length. In

¹¹ Inches of water column ("in. wc") is a unit of pressure conventionally used for measurement of pressure differentials.

¹² The duct material, length, diameter, shape, and configuration are used to calculate the ESP generated in the duct, along with the temperature and flow rate of the air passing through the duct. The conditions during normal operation that result in a maximum ESP are used to calculate the reported maximum ESP values, which are dependent on individual unit design and represent manufacturer-recommended installation and use.

¹³ Calculations were conducted over an absolute roughness range of 1.0-4.6 mm for flexible duct as defined in pages 1-2 of an OSTI Journal Article on pressure loss in flexible HVAC ducts at <https://www.osti.gov/servlets/purl/836654> (Docket No. EERE-2019-BT-WAV-0028-0013) and available at <http://www.regulations.gov>.

the absence of field data, DOE expects that a range of duct lengths from the minimal length to the maximum allowable length would be used; thus, DOE believes that half of the maximum ESP would be representative of most installations. For basic models with condensing or evaporator units that are not designed for the ducting of air, this design characteristic must be clearly stated.

Additionally, if there are multiple condenser or evaporator unit fan speed settings, the speed setting used would be as instructed in the unit's installation instructions. However, if the installation instructions do not specify a fan speed setting for ducted installation, systems that can be installed with ducts would be tested with the highest available fan speed. The ESP would be set for testing either by symmetrically restricting the outlet duct¹⁴ or, if using the indoor air enthalpy method, by adjusting the airflow measurement apparatus blower.

The alternate test procedure also describes the requirements for measurement of ESP consistent with provisions provided in AHRI 1250-2020 when using the indoor air enthalpy method with unit coolers.

Additionally, the alternate test procedure indicates that specified basic models that are split systems must be tested as matched pairs. According to CellarPro's petition, the walk-in refrigeration system basic models that are split-systems are sold as full systems (*i.e.*, matched pairs) rather than as individual unit cooler and condensing unit components. This Interim Waiver Order provides no direction regarding refrigerant line connection operating conditions, and as such is inapplicable to testing the basic models as individual components. Consequently,

¹⁴ This approach is used for testing of furnace fans, as described in Section 8.6.1.1 of 10 CFR part 430, appendix AA to subpart B.

the Interim Waiver Order addresses only matched-pair testing of the specified basic models that are split-systems.

DOE notes that, despite the request from CellarPro, it is not including a 0.55 correction factor in the alternate test procedure required by the Interim Waiver Order. The company claimed that such a factor would correct for differences in wine cellar refrigeration system fan power, compressor efficiency, and run time and load conditions. CellarPro also observed that the test procedure in appendix A to subpart B of 10 CFR part 430 (“Appendix A”), includes such a factor to account for the difference in use and loading patterns of coolers (*e.g.*, self-contained wine chiller cabinets) as compared to other residential refrigeration products and sought to include a factor as part of its petition. Coolers, like other residential refrigeration products, are tested in a 90 °F room without door openings (section 2.1.1 of Appendix A). The intent of the energy test procedure for residential refrigeration products is to simulate operation in typical room conditions (72 °F) with door openings by testing at 90 °F ambient temperature without door openings. 10 CFR 430.23(ff)(7). In section 5.2.1.1 of Appendix A, a correction factor of 0.55 is applied to the measured energy consumption of coolers so that measuring energy consumption at 90 °F ambient temperature without door openings provides test results that are representative of consumer usage at 72 °F ambient temperature with door openings. Specifically, the 0.55 correction factor reflects that (1) closed-door operation of self-contained coolers in typical 72 °F room conditions results in an average energy consumption 0.46 times the value measured at the 90 °F ambient temperature specified by the test procedure; and (2) expected door openings of a self-contained wine chiller would add an additional 20 % thermal load. Multiplying 0.46 by 1.2 results in the overall correction factor of 0.55. See 81 FR 46768, 46782 (July 18, 2016) (final rule for miscellaneous refrigeration products).

In contrast, these same closed-door conditions on which the miscellaneous refrigeration correction factor is based are not present in the test procedure for walk-in cooler refrigeration systems. The WICF test procedure does not provide for closed-door testing at elevated ambient temperatures as the test procedure for residential refrigeration products does because walk-ins are tested and rated by component, with a walk-in refrigeration system tested and rated separately from a walk-in enclosure (panels and doors). See 76 FR 21580. Walk-in refrigeration load is set by using a representative ratio of box load to capacity (see discussion below). As a result, applying the 0.55 correction factor as suggested by CellarPro is not appropriate for the specified basic models.

Further, CellarPro asserted that the suggested 0.55 correction factor was to address the differences in run time and compressor inefficiency of the specified basic models as compared to walk-in cooler refrigeration systems more generally. It suggested that the run time for wine cellar walk-in refrigeration systems ranges from 50 to 75 percent. AHRI 1250-2009 accounts for percent run time in the AWEF calculation by setting walk-in box load equal to specific fractions of refrigeration system net capacity—the fractions are defined based on whether the refrigeration system is for cooler or freezer applications, and whether it is designed for indoor or outdoor installation (see sections 6.2 (applicable to coolers) and 6.3 (applicable to freezers) of AHRI 1250-2009). The alternate test procedure provided by this interim waiver requires calculating AWEF based on setting the walk-in box load equal to half of the refrigeration system net capacity, without variation according to high and low load periods and without variation with outdoor air temperature for outdoor refrigeration systems. Setting the walk-in box load equal to half the refrigeration system net capacity results in a refrigeration system run time fraction slightly above 50 percent, which is in the range suggested by CellarPro as being representative for the specified basic models. As previously discussed, walk-in energy consumption is determined by component, with separate test procedures for walk-in refrigeration systems, doors,

and panels. Section 6 of AHRI 1250-2009 provides equations for determining refrigeration box load as a function of refrigeration system capacity. Using these equations with an assumed load factor of 50 percent maintains consistency with Appendix C while providing an appropriate load fraction for wine cellar refrigeration systems. Accordingly, DOE has declined to adopt a correction factor for the equipment at issue.

Based on DOE's review of CellarPro's petition, the required alternate test procedure laid out in the Interim Waiver Order appears to allow for the accurate measurement of energy efficiency of the specified basic models, while alleviating the testing issues associated with CellarPro's implementation of wine cellar walk-in refrigeration system testing for these basic models. Consequently, DOE has determined that CellarPro's petition for waiver will likely be granted. Furthermore, DOE has determined that it is desirable for public policy reasons to grant CellarPro immediate relief pending a determination of the petition for waiver.

For the reasons stated, it is **ORDERED** that:

(1) CellarPro must test and rate the following CellarPro-branded wine cellar walk-in refrigeration system basic models¹⁵ with the alternate test procedure set forth in paragraph (2).

CellarPro Basic Models					
Basic Model	Catalog Models Under Basic Model Group	Minimum Operating Temperature (°F)	Maximum Operating Temperature (°F)	Maximum Evaporator Fan External Static Pressure (inwg)	Maximum Condenser Fan External Static Pressure (inwg)

¹⁵ Basic model 2000VS was initially included twice in CellarPro's petition, prior to a clarifying email on October 26, 2020 from CellarPro stating that this repeated model was intended to be basic model 2000VS 220V (CellarPro, No. 7).

1800QTL	1800QTL, 1800QTL-L	45	65	0.00	0.00
1800QT	Same	45	65	0.00	0.00
1800XT	Same	45	65	0.00	0.00
1800XTS	1800XTS, 1800XTS-B	45	65	0.00	0.00
1800XTSx	Same	45	65	0.00	0.00
1800XT 220V	Same	45	65	0.00	0.00
1800XTS 220V	Same	45	65	0.00	0.00
1800XTx 220V	Same	45	65	0.00	0.00
1800H	Same	51	65	0.09	0.09
1800H 220V	Same	51	65	0.09	0.09
2000VS	2000VSi, 2000VSx	45	65	0.19	0.19
2000VS 220V	2000VSi 220V, 2000VSx 220V	45	65	0.19	0.19
3200VS	3200VSi, 3200VSx	45	65	0.25	0.25
4200VS	4200VSi, 4200VSx, 4200VSi-B, 4200VSi-L	45	65	0.25	0.25
4200VS 220V	4200VSi 220V, 4200VSx 220V	45	65	0.25	0.25
6200VS	6200VSi, 6200VSx	45	65	0.25	0.25
8200VS	8200VSi, 8200VSx	45	65	0.25	0.25
3000S	3000S, 3000Sqc	45	65	0.25	0.00
3000Scm	Same	47	65	0.00	0.00
3000Scmr	Same	45	65	0.25	0.00
3000Sh	3000Sh, 3000Shqc	45	65	0.25	0.00
4000S	4000S, 4000Sqc	45	65	0.25	0.00
4000S 220V	Same	45	65	0.25	0.00
4000Scm	Same	47	65	0.00	0.00
4000Scmr	Same	45	65	0.25	0.00
4000Sh	4000Sh, 4000Shqc	45	65	0.25	0.00
4000Shwc	Same	45	65	0.25	0.00
4000Swc	Same	45	65	0.25	0.00
6000S	Same	45	65	0.25	0.00

(2) The alternate test procedure for the CellarPro basic models identified in paragraph (1) of this Interim Waiver Order is the test procedure for Walk-in Cooler Refrigeration Systems prescribed by DOE at 10 CFR part 431, subpart R, appendix C (“Appendix C to Subpart R”), except as detailed below. All other requirements of Appendix C to Subpart R, and DOE’s regulations remain applicable.

In Appendix C to Subpart R, revise section 3.1.1 (which specifies modifications to AHRI 1250-2009 (incorporated by reference; see §431.303)) to read:

3.1.1. In Table 1, Instrumentation Accuracy, refrigerant temperature measurements shall have an accuracy of ± 0.5 °F for unit cooler in/out. Measurements used to determine temperature or water vapor content of the air (*i.e.* wet bulb or dew point) shall be accurate to within ± 0.25 °F; all other temperature measurements shall be accurate to within ± 1.0 °F.

In Appendix C to Subpart R, revise section 3.1.4 (which specifies modifications to AHRI 1250-2009) and add modifications of AHRI 1250-2009 Tables 3 and 4 to read:

3.1.4. In Tables 3 and 4 of AHRI 1250-2009, Section 5, the Condenser Air Entering Wet-Bulb Temperature requirement applies only to single-packaged dedicated systems. Tables 3 and 4 shall be modified to read:

Table 3. Fixed Capacity Matched Refrigerator System and Single-Packaged Dedicated System, Condensing Unit Located Indoor						
Test Description	Unit Cooler Air Entering Dry-Bulb, °F	Unit Cooler Air Entering Relative Humidity, %¹	Condenser Air Entering Dry-Bulb, °F	Maximum Condenser Air Entering Wet-Bulb, °F	Compressor Status	Test Objective
Evaporator Fan Power	55	55	-	-	-	Measure fan input wattage ²
Refrigeration Capacity	55	55	90	65 ³	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, input power, and EER at Rating Condition

Notes:

1. The test condition tolerance (maximum permissible variation of the average value of the measurement from the specified test condition) for relative humidity is 3%.
2. Measure fan input wattage either by measuring total system power when the compressor and condenser are turned off or by separately submetering the evaporator fan.
3. Maximum allowable value for Single-Packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.

Table 4. Fixed Capacity Matched Refrigerator System and Single-Packaged Dedicated System, Condensing Unit Located Outdoor

Test Description	Unit Cooler Air Entering Dry-Bulb, °F	Unit Cooler Air Entering Relative Humidity, %¹	Condenser Air Entering Dry-Bulb, °F	Maximum Condenser Air Entering Wet-Bulb, °F	Compressor Status	Test Objective
Evaporator Fan Power	55	55	-	-	-	Measure fan input wattage ²
Refrigeration Capacity A	55	55	95	68 ³	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, input power, and EER at Rating Condition
Refrigeration Capacity B	55	55	59	46 ³	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler and system input power at moderate condition
Refrigeration Capacity C	55	55	35	29 ³	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler and system input power at cold condition

Notes:

1. The test condition tolerance (maximum permissible variation of the average value of the measurement from the specified test condition) for relative humidity is 3%.
2. Measure fan input wattage either by measuring total system power when the compressor and condenser are turned off or by separately submetering the evaporator fan.
3. Maximum allowable value for Single-Packaged Dedicated Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.

In Appendix C to Subpart R, following section 3.2.5 (instructions regarding modifications to AHRI 1250-2009), add sections 3.2.6 and 3.2.7 to read:

3.2.6 The purpose in section C1 of appendix C is modified by extending it to include Single-Packaged Dedicated Systems.

3.2.7 For general test conditions and data recording (appendix C, section C7), the test acceptance criteria in Table 2 and the data to be recorded in Table C2 apply to the Dual Instrumentation and Calibrated Box methods of test.

In Appendix C to Subpart R, revise section 3.3 to read:

3.3. Matched systems, single-packaged dedicated systems, and unit coolers tested alone:

Test any split system wine cellar walk-in refrigeration system as a matched pair. Any condensing unit or unit cooler component must be matched with a corresponding counterpart for testing. Use the test method in AHRI 1250-2009 (incorporated by reference; see §431.303), appendix C as the method of test for matched refrigeration systems, single-packaged dedicated systems, or unit coolers tested alone, with the following modifications:

* * * * *

In Appendix C to Subpart R, revise sections 3.3.3 through 3.3.3.2 to read:

3.3.3 Evaporator fan power.

3.3.3.1 The unit cooler fan power consumption shall be measured in accordance with the requirements in Section C3.5 of AHRI 1250-2009. This measurement shall be made with the fan operating at full speed, either measuring unit cooler or total system power input upon the completion of the steady state test when the compressors and condenser fan of the walk-in system is turned off, or by submetered measurement of the evaporator fan power during the steady state test.

Section C3.5 of AHRI 1250-2009 is revised to read:

Unit Cooler Fan Power Measurement. The following shall be measured and recorded during a fan power test.

$EF_{comp,on}$	Total electrical power input to fan motor(s) of Unit Cooler, W
FS	Fan speed (s), rpm
N	Number of motors
P_b	Barometric pressure, in. Hg
T_{db}	Dry-bulb temperature of air at inlet, °F
T_{wb}	Wet-bulb temperature of air at inlet, °F
V	Voltage of each phase, V

For a given motor winding configuration, the total power input shall be measured at the highest nameplated voltage. For three-phase power, voltage imbalance shall be no more than 2 %.

3.3.3.2. Evaporator fan power for the off cycle is equal to the on-cycle evaporator fan power with a run time of ten percent of the off-cycle time.

$$EF_{comp,off} = 0.1 \times EF_{comp,on}$$

In Appendix C to Subpart R, following section 3.3.7.2, add new sections 3.3.8, 3.3.9, and 3.3.10 to read:

3.3.8. Measure power and capacity of single-packaged dedicated systems as described in sections C4.1.2 and C9 of AHRI 1250-2020. The third and fourth sentences of Section C9.1.1.1 of AHRI 1250-2020 (“Entering air is to be sufficiently dry as to not produce frost on the Unit Cooler coil. Therefore, only sensible capacity measured by dry bulb change shall be used to calculate capacity.”) shall not apply.

3.3.9. For systems with ducted evaporator air, or that can be installed with or without ducted evaporator air: Connect ductwork on both the inlet and outlet connections and determine external static pressure as described in ASHRAE 37-2009, sections 6.4 and 6.5. Use pressure measurement instrumentation as described in ASHRAE 37-2009, section 5.3.2. Test at the fan speed specified in manufacturer installation instructions—if there is more than one fan speed setting and the installation instructions do not specify which speed to use, test at the highest speed. Conduct tests with the external static pressure equal to 50 percent of the maximum external static pressure allowed by the manufacturer for system installation within a tolerance of -0.00/+0.05 in. wc. If testing with the indoor air enthalpy method, adjust the airflow measurement apparatus fan to set the external static pressure—otherwise, set the external static pressure by symmetrically restricting the outlet of the test duct. In case of conflict, these requirements for setting

evaporator airflow take precedence over airflow values specified in manufacturer installation instructions or product literature.

3.3.10. For systems with ducted condenser air, or that can be installed with or without ducted condenser air: Connect ductwork on both the inlet and outlet connections and determine external static pressure as described in ASHRAE 37-2009, sections 6.4 and 6.5. Use pressure measurement instrumentation as described in ASHRAE 37-2009, section 5.3.2. Test at the fan speed specified in manufacturer installation instructions—if there is more than one fan speed setting and the installation instructions do not specify which speed to use, test at the highest speed. Conduct tests with the external static pressure equal to 50 percent of the maximum external static pressure allowed by the manufacturer for system installation within a tolerance of $-0.00/+0.05$ in. wc. If testing with the outdoor enthalpy method, adjust the airflow measurement apparatus fan to set the external static pressure—otherwise, set the external static pressure by symmetrically restricting the outlet of the test duct. In case of conflict, these requirements for setting condenser airflow take precedence over airflow values specified in manufacturer installation instructions or product literature. If testing using the outdoor air enthalpy method, the requirements of section 8.6 of ASHRAE 37-2009 are not applicable.

In Appendix C to Subpart R, revise section 3.3.6 (which specifies modifications to AHRI 1250-2009) to read:

3.3.6. AWEF is calculated on the basis that walk-in box load is equal to half of the system net capacity, without variation according to high and low load periods and without variation with outdoor air temperature for outdoor refrigeration systems, and the test must be done as a matched or single-package refrigeration system, as follows:

For Indoor Condensing Units:

$$\dot{B}L = 0.5 \cdot \dot{q}_{ss}(90 \text{ F})$$

$$LF = \frac{\dot{B}L + 3.412 \cdot \dot{E}F_{comp,off}}{\dot{q}_{ss}(90 \text{ F}) + 3.412 \cdot \dot{E}F_{comp,off}}$$

$$AWEF = \frac{\dot{B}L}{\dot{E}_{ss}(90 \text{ F}) \cdot LF + \dot{E}F_{comp,off} \cdot (1 - LF)}$$

For Outdoor Condensing Units:

$$\dot{B}L = 0.5 \cdot \dot{q}_{ss}(95 \text{ F})$$

$$LF(t_j) = \frac{\dot{B}L + 3.412 \cdot \dot{E}F_{comp,off}}{\dot{q}_{ss}(t_j) + 3.412 \cdot \dot{E}F_{comp,off}}$$

$$AWEF = \frac{\sum_{j=1}^n BL(t_j)}{\sum_{j=1}^n E(t_j)}$$

$$BL(t_j) = \dot{B}L \cdot n_j$$

$$E(t_j) = [\dot{E}_{ss}(t_j) \cdot LF(t_j) + \dot{E}F_{comp,off} \cdot (1 - LF(t_j))] \cdot n_j$$

Where: $\dot{B}L$ is the non-equipment-related box load

LF is the load factor

And other symbols are as defined in AHRI 1250-2009.

(3) Representations. CellarPro may not make representations about the efficiency of a basic model listed in paragraph (1) of this Interim Waiver Order for compliance, marketing, or other purposes unless that basic model has been tested in accordance with the provisions set forth above and such representations fairly disclose the results of such testing.

(4) This interim waiver shall remain in effect according to the provisions of 10 CFR 431.401.

(5) This Interim Waiver Order is issued on the condition that the statements and representations provided by CellarPro are valid. If CellarPro makes any modifications to the controls or configurations of a basic model subject to this Interim Waiver Order, such modifications will render the waiver invalid with respect to that basic model, and CellarPro will either be required to use the current Federal test method or submit a new application for a test procedure waiver.

DOE may rescind or modify this waiver at any time if it determines the factual basis underlying the petition for the Interim Waiver Order is incorrect, or the results from the alternate test procedure are unrepresentative of a basic model's true energy consumption characteristics. 10 CFR 431.401(k)(1). Likewise, CellarPro may request that DOE rescind or modify the Interim Waiver Order if CellarPro discovers an error in the information provided to DOE as part of its petition, determines that the interim waiver is no longer needed, or for other appropriate reasons. 10 CFR 431.401(k)(2).

(6) Issuance of this Interim Waiver Order does not release CellarPro from the certification requirements set forth at 10 CFR part 429.

DOE makes decisions on waivers and interim waivers for only those basic models specifically set out in the petition, not future models that may be manufactured by the petitioner. CellarPro may submit a new or amended petition for waiver and request for grant of interim waiver, as appropriate, for additional basic models of Walk-in Cooler Refrigeration Systems. Alternatively, if appropriate, CellarPro may request that DOE extend the scope of a waiver or an interim waiver to include additional basic models employing the same technology as the basic model(s) set forth in the original petition consistent with 10 CFR 431.401(g).

Signing Authority

This document of the Department of Energy was signed on February 22, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Acting Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to

sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on February 23, 2021.

Treena V. Garrett,
Federal Register Liaison Officer,
U.S. Department of Energy.



Appendix 1

AS_Waiver_Requests@ee.doe.gov
U.S. Department of Energy
Building Technologies Program
Test Procedure Waiver
1000 Independence Avenue SW.
Mailstop EE-5B
Washington, DC 20585-0121

Date: 10/02/20

Revision: Updated Basic Models table as requested by Lucy deButts on 10/2/20 (pages 4-5). Removed discussion related to EC motors, all products will comply with requirement for EC evaporator fan motors.

Subject: Application for Interim Waiver

Dear U.S. Department of Energy,

CellarPro is requesting for Interim Waiver from a DOE test procedure pursuant to provisions described in 10 CFR 431.401 for the following products on the grounds that "either the basic model contains one or more design characteristics that prevent testing of the basic model according to the prescribed test procedures or the prescribed test procedures evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data."

DOE uniform test method for the measurement of energy consumption of walk-in coolers and walk-in freezers (WICF) described in 10 CFR 431.304 adopts the test standard set forth in AHRI 1250-2009. Both 10 CFR 431 and AHRI 1250 define WICF products as "...an enclosed storage space refrigerated to temperatures, respectively, above, and at or below 32 degrees Fahrenheit that can be walked into, and has a total chilled storage area of less than 3,000 square feet...". Wine cellar cooling systems meet this definition. Therefore, WICF products are subject to the test method and minimum energy requirements as described in 10 CFR 431.401. We do not feel that this was the original intent. The calculations for AWEF do not accurately reflect the conditions that wine cellar cooling products operate at. As a result, the current minimum AWEF values cannot be met.

The design characteristics constituting the grounds for the Interim Waiver Application:

The Wine Cellar application definition is unique from Walk-In Coolers and Freezers (WICF). A Wine Cellar is defined as an enclosed storage space designed for the long term cooling and storing of wine at a temperature range of 45°F to 65°F, and a relative humidity range of 50%-70%RH.

Wine Cellar Coolers are primarily for residential enclosures. Key market demands are small footprint cooling units, optional airflow ducting for hot and cold sides, low noise, and high sensible heat ratios.

These criteria add to the energy demands impacting the DOE AWEF minimums compared to a commercial WICF as outlined in the Technical Justifications section.

AHRI 1250-2009 does not contain a definition of single packaged and matched pair refrigeration systems, however, as seen in Section 3.12 of the public comment version of soon to be published revision of AHRI 1250, these types of products are defined as follows:

3.12 Refrigeration System. The mechanism (including all controls and other components integral to the system's operation) used to create the refrigerated environment in the interior of a walk-in cooler or walk-in freezer, consisting of:

*A Dedicated Condensing Unit; or
A Unit Cooler.*

3.12.1 Matched Refrigeration System (Matched-pair). A combination of a Dedicated Condensing Unit and one or more Unit Coolers specified by the Dedicated Condensing Unit manufacturer which are all distributed in commerce together. Single-Packaged Dedicated Systems are a subset of Matched Refrigeration Systems.

3.12.2 Single-packaged Refrigeration System (Single-packaged). A Matched Refrigeration System that is a Single-packaged assembly that includes one or more compressors, a condenser, a means for forced circulation of refrigerated air, and elements by which heat is transferred from air to refrigerant, without any element external to the system imposing resistance to flow of the refrigerated air.

SELF-CONTAINED COOLING SYSTEMS FOR WINE CELLAR ENCLOSURES (refer to single-packaged walk-in cooler refrigeration systems in AHRI 1250)

- Self-contained cooling systems are designed to provide cold environment between 45~65 °F and maintain relative humidity within the range of 50~70% for properly insulated and sized wine cellars.
- These temperature and relative humidity ranges are optimized for long term storage of wine as opposed to chilling for serving applications.
- These cooling systems are all-in-one ready for use and no more refrigerant piping is required in the field.
- These cooling systems are factory-built, critically charged and tested, and only require through-the-wall or remote mount ducted installation on wine cellars.
- These systems are available as indoor or outdoor uses with automatic off-cycle air defrost.
- Wine cellar enclosures are usually located in air-conditioned spaces.

SPLIT COOLING SYSTEMS FOR WINE CELLAR ENCLOSURES (refer to matched-pair walk-in cooler refrigeration systems in AHRI 1250)

- Split cooling systems are designed to provide cold environment between 45~65 °F and maintain relative humidity range within 50~70% for properly insulated wine cellars.
- These temperature and relative humidity ranges are optimized for long term storage of wine as opposed to chilling for serving applications.
- These cooling systems consist of a remote condensing unit and an evaporator unit, which are connected by a liquid line and an insulated suction line.

- These systems must be charged properly with refrigerant in the field.
- The evaporator portion of the split system may be located in the wine cellar, or remote mounted and ducted to the cellar.
- These systems are available as indoor or outdoor uses with automatic off-cycle air defrost.
- Wine cellars are usually located in air-conditioned spaces.

AHRI 1250 specifies that for walk-in coolers, the refrigeration system is to be rated at an air-return temperature of 35°F (box setpoint). This is below the minimum temperature range for wine cellar cooler applications. Operating a wine cellar at this condition would adversely mechanically alter the intended performance of the system including icing of the evaporator coil, potential damage to the compressor, and will not result in an accurate representation of the performance of the cooling unit. Wine cellars generally are kept at 55°F.

There are three areas impacting energy consumption where the design of wine cellar cooling systems differs from walk-in cooler refrigeration systems. These are outlined below and described in detail in the Technical Justifications section:

1. Run Time and Load Conditions: The calculation of the Annual Walk-in Energy Factor (AWEF) found in AHRI 1250 accounts for typical usage of WICF products with high and low load periods. Wine cellars are loaded with wine bottles for long term storage, and remain relatively undisturbed. These load conditions do not resemble the use patterns that are representative of typical WICF products. Therefore, the AWEF calculation described in 10 CFR 431.304 and AHRI 1250 does not match the applications of wine cellar cooling systems which are designed to operate at 100% low load conditions.
2. Compressor Efficiencies: The compressors used in wine cellar cooling systems are predominately fractional horsepower, which are inherently less efficient than larger compressors used in walk-in cooler refrigeration systems. Therefore, there is currently no technology on the market that will provide the needed energy efficiency in wine cellar cooling systems to meet the minimum AWEF value for commercial walk-in cooler refrigeration systems set forth in 10 CFR 431.306.
3. Fan Power: As defined in 10 CFR 431.301(c)2(ii) for medium temperature system fans: $EF_{comp,on} (W) = 0.013 (W/BTUH) * q_{mix,cd}(BTUH)$. The design of wine cellar cooling systems requires higher fan power than is allowed for in this calculation for WICF systems.

The prescribed test procedure is unrepresentative of the product's true energy characteristics. The characteristics described above prevent testing of the basic model according to the prescribed test procedures or cause the prescribed test procedures to evaluate the basic model in a manner so unrepresentative of its true energy consumption characteristics as to provide materially inaccurate comparative data.

Basic Models on which the Interim Waiver is being requested. The brand name for all models is “CellarPro”:

CellarPro Basic Models					
Basic Model	Catalog Models Under Basic Model Group	Minimum Operating Temperature (°F)	Maximum Operating Temperature (°F)	Maximum Evaporator Fan External Static Pressure (inwg)	Maximum Condenser Fan External Static Pressure (inwg)
1800QTL	1800QTL, 1800QTL-L	45	65	0.00	0.00
1800QT	Same	45	65	0.00	0.00
1800XT	Same	45	65	0.00	0.00
1800XTS	1800XTS, 1800XTS-B	45	65	0.00	0.00
1800XTSx	Same	45	65	0.00	0.00
1800XT 220V	Same	45	65	0.00	0.00
1800XTS 220V	Same	45	65	0.00	0.00
1800XTx 220V	Same	45	65	0.00	0.00
1800H	Same	51	65	0.09	0.09
1800H 220V	Same	51	65	0.09	0.09
2000VS	2000VSi, 2000VSx	45	65	0.19	0.19
2000VS 220V	2000VSi 220V, 2000VSx 220V	45	65	0.19	0.19
3200VS	3200VSi, 3200VSx	45	65	0.25	0.25
4200VS	4200VSi, 4200VSx, 4200VSi-B, 4200VSi-L	45	65	0.25	0.25
4200VS 220V	4200VSi 220V, 4200VSx 220V	45	65	0.25	0.25
6200VS	6200VSi, 6200VSx	45	65	0.25	0.25
8200VS	8200VSi, 8200VSx	45	65	0.25	0.25
3000S	3000S, 3000Sqc	45	65	0.25	0.00
3000Scm	Same	47	65	0.00	0.00
3000Scmr	Same	45	65	0.25	0.00
3000Sh	3000Sh, 3000Shqc	45	65	0.25	0.00
4000S	4000S, 4000Sqc	45	65	0.25	0.00
4000S 220V	Same	45	65	0.25	0.00
4000Scm	Same	47	65	0.00	0.00
4000Scmr	Same	45	65	0.25	0.00
4000Sh	4000Sh, 4000Shqc	45	65	0.25	0.00
4000Shwc	Same	45	65	0.25	0.00
4000Swc	Same	45	65	0.25	0.00
6000S	Same	45	65	0.25	0.00

6000S 220V	Same	45	65	0.25	0.00
6000Scm	Same	47	65	0.00	0.00
6000Scmr	Same	45	65	0.25	0.00
8000S	Same	45	65	0.25	0.00
8000Scm	Same	47	65	0.00	0.00
8000Scmr	Same	45	65	0.25	0.00
8000Swc	Same	45	65	0.25	0.00
AH6500S	AH6500SCv, AH6500SCh, AH6500Si, AH6500Sx	45	65	0.25	0.25
AH8500S	AH8500SCv, AH8500SCh, AH8500Si, AH8500Sx	45	65	0.25	0.25
AH12Sx	Same	45	65	0.30	0.00
AH18Sx	Same	45	65	0.30	0.00
AH24Sx	Same	45	65	0.30	0.00

Specific Requirements sought to be waived

Petitioning for a waiver to exempt wine cellar cooler systems from being tested to the current test procedures, specifically the requirement for the refrigeration system to be rated at an air-return temperature of 35°F.

The petition also includes a correction factor of 0.55 to be applied to final AWEF calculations for wine cellar products to allow the unit to pass minimum efficiency as delineated by 10 CFR §431 Subpart R. This is based on a precedent: Appendix A to Subpart B of 10 CFR §430 - Uniform Test Method for Measuring the Energy Consumption of Refrigerators, Refrigerator-Freezers, and Miscellaneous Refrigeration Products

- 55° F rating point
- 0.55 K factor (DOE Direct Final Rule EERE-2011-BT-STD-0043-0122)

The Technical Justifications section details the variations in energy use to support the above mentioned precedent.

We also request allowance for an alternate test procedure. The test method in AHRI 1250-2009 does not allow the option to test refrigeration capacity and power consumption using air enthalpy, only refrigerant enthalpy utilizing mass flow meters. Due to the complexity of installing mass flow meters in small footprint, low refrigerant charge systems, we would like the option to test to the pending revision detailed in AHRI 1250-2019 section C4.1.2 and Table C4, which allows air enthalpy data. This method of testing is currently referenced in ANSI/ASHRAE Standard 16-2016 used for Room Air Conditioners ANSI/AHAM RAC-1-2015, and is already documented as relevant to the WCIF group as indicated by the AHRI 1250-2019 draft.

Since wine cellar cooling units are designed with a high sensible heat ratio and passive humidity management (meaning humidity is not added to the cellar during unit operation through the cooling unit), we believe the current test method requiring measurement of sensible cooling capacity only is consistent with the design and operation of the cooling units.

List of manufacturers of all other basic models marketing in the United States and known to the petitioner to incorporate similar design characteristics –

- a) Air Innovations
- b) BreezAire
- c) CellarPro
- d) Vinotemp
- e) WhisperKool

Proposed alternate test procedure

AHRI 1250 test procedure will be followed, but with the following modifications:

1. Temperature of the air returning to the walk-in cooling unit shall be 55°F.
2. The AWEF calculations shall include a correction factor of 0.55 to adjust the final AWEF value for wine-related products to meet minimum efficiency standards.
3. Option to test using air enthalpy data to determine cooling capacity.

Technical Justifications for the alternate test procedure:

Three areas are considered for Technical Justifications: Run Time, Compressor, and Fans. The differences between wine cellar coolers and WCIF are indicated by a correction factor, which is combined using the formula $CF = \text{Run Time CF} * \text{Compressor CF} * \text{Fan CF}$ to justify the recommended 0.55 AWEF correction factor.

1. Run Time and Load Conditions

AHRI 1250-2009 assumes an 80% run time that rolls up into the AWEF, 70% low load, and 10% high load. Due to the humidity management requirements for wine cellars, it is preferable to limit the total run time between 50-75% to minimize the dehumidification effect of the refrigeration cycle. In addition, wine cellars are designed to operate under low load conditions only. We are requesting a correction factor of 0.95 to compensate for these differences.

Recommendation: AWEF correction factor for run time: Run Time CF = 0.95

2. Compressor Efficiencies

The compressor technologies available for wine cellar applications have an impact on Energy Efficiency Minimums:

- Variable Speed Compressors: AHRI 1250-2009 allows for the benefit of variable speed compressors by use of capacity modulation during high and low load conditions. For wine

cellars designed to operate under low load conditions only, we cannot take advantage of capacity modulation to reduce energy consumption.

- Wine Cellar Coolers in the 1500BTUH to 4000BTUH range are the most typical, and the compressor technologies available on the market in those sizes cannot meet the EER targets expected for compressors in AHRI 1250-2009. This is detailed below by comparing compressor efficiencies for a 4000BTUH compressor common for wine cellars, to an 8000BTUH compressor common to walk-in refrigerators. The compressor selections shown are for compressors representative of the those available on the market in this BTUH range.
 - (1) Evaluating a reciprocating compressor selection at Wine Cellar rating conditions and 4000 BTUH results in a compressor EER of 7.84.
 - (2) Evaluating a reciprocating compressor selection at Wine Cellar rating conditions and 8000 BTUH showing a compressor EER of 9.39.
 - (3) Comparing the ratio of compressor EERs at 4000BTUH@7.84EER vs 8000BTUH@9.39EER results in the following ratio: $7.84/9.39 = 0.835$. This demonstrates the issues with compressor efficiencies available in the smaller BTUH sizes compared to compressor sizes more common in the WICF products.

Recommendation: AWEF correction factor for compressors: Compressor CF = 0.835

3. Fan Power

As defined in 10 CFR 431.301(c)2(ii) for medium temperature system fans:

$$EF_{comp,on} (W) = 0.013 (W/BTUH) * q_{mix,cd}(BTUH)$$

For a 4000BTUH unit, the maximum fan power assumption is $0.013 * 4000 = 52W$. This is lower than fan motors typically applied to CellarPro Wine Cooling Units for the following reasons:

- Since the application is largely residential cellars, small footprint cooling units with low noise are key market drivers. As a result of the small footprint and the need for high sensible heat ratios to maintain cellar humidity, the coils have higher fin densities (FPI=Fins Per Inch): 10-14 FPI for wine cellar coolers compared to 6-8 FPI for walk-in cooler air defrost units. High fin density coils create higher static pressure requirements on the evaporator fan compared to WICF.
- Installations are typically ducted, either cold side, hot side, or both. As a result, the fans need to be capable of delivering rated CFM with external static pressures typical of ducting runs.

The combination of the static pressure fan load, footprint constraints, and low noise requirements described above results in fan designs that require higher shaft power motors and low noise fan configurations than a typical WICF axial fan. CellarPro Wine Cellar Coolers utilize a mix of axial fans with deep blade pitch and tight venturi tolerances, forward curved centrifugal blowers, or reverse inclined centrifugal fans.

The following AWEF calculations compare the 10 CFR 431.301(c)2(ii) fan power to a typical CellarPro Wine Cellar Cooler fan power.

- I. Reference AWEF calculation for CellarPro model 4200VSi as manufactured with a forward curved centrifugal fan/motor combination and an EFcomp,on value of 158 W. The resulting AWEF = 4.01.

AWEF for Indoor Fixed Capacity Matched Systems Per AHRI 1250P (I-P)-2009 Adjusted for Final Rule			
CU Model		4200VSi	
Application		Refrigerator	
Defrost Method		Air	
Recommended Defrosts per Day		0	
Adaptive Defrost Available		No	
Frost Load Test Run		No	
Steady State Refrigeration Capacity	qss (90°F) (Btu/h)	3892	From test
Steady State Power Consumption	Ess (90°F) (W)	843.5	From test
On-cycle evaporator fan power	EF _{comp,on} (W)	158	From test
Off-cycle evaporator fan power	EF _{comp,off} (W)	31.6	From test
Dry Coil Defrost Cycle Energy Input	DF _d (W-h)	0	From test
Frost Coil Defrost Cycle Energy Input	DF _f (W-h)	0	From test
Gross Refrigeration Capacity	q _{mixture} (90°F) (Btu/h)	4431	AHRI 1250P-2009 [106]
Frost Coil Defrost Cycle Energy Input	DF _f (W-h)	0	10 CFR 431.304(c)(10)(ix)
Number of Defrosts per Day	N _{DF}	0.0	10 CFR 431.304(c)(10)(ix) & (x) & (xii)
Daily Defrost Energy	DF (W-h)	0	AHRI 1250P-2009 [C13] & 10 CFR 431.304(c)(10)(xii)
Daily Defrost Heat Load Contribution	Q _{DF} (Btu)	0	10 CFR 431.304(c)(10)(xi) & 10 CFR 431.304(c)(10)(xii)
Defrost Power Consumption	DFdot (W)	0	AHRI 1250P-2009 [C15]
Defrost Power Consumption Contributed to Box Load	Q _{DFdot} (Btu/h)	0	AHRI 1250P-2009 [C16]
Box Load High	BLH (Btu/h)	2724	AHRI 1250P-2009 [1] or [5]
Box Load Low	BLL (Btu/h)	389	AHRI 1250P-2009 [2] or [6]
Load Factor High	LFH	0.71	AHRI 1250P-2009 [97]
Load Factor Low	LFL	0.12	AHRI 1250P-2009 [98]
Box Load Sum	BL (Btu)	1.0E+07	AHRI 1250P-2009 [16]
Power Consumption Sum	E (W-h)	2.5E+06	AHRI 1250P-2009 [17]
	AWEF (Btu/Wh)	4.01	AHRI 1250P-2009 [15] or [99]
	Class	DC.M.I.	
	Minimum AWEF (Btu/Wh)	5.61	10 CFR 431.306(e)
	Meets Requirements	No	
Notes: Values in [xx] refer to equation numbers in AHRI 1250. In general, these calculations are described in 7.4 & 7.7.			
DOE-AHRI 1250 Calculator Full (04-08-15).xlsx		DC.x.l (MATCH)	
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- II. Reference AWEF calculation for CellarPro 4200VSi assuming the DOE default evaporator fan motor rating of 0.013 W/BTUH. In this case $EF_{comp,on} (W) = 0.013 \times 3892 = 51$ W. The resulting AWEF = 5.85.

AWEF for Indoor Fixed Capacity Matched Systems Per AHRI 1250P (I-P)-2009 Adjusted for Final Rule			
CU Model	4200VSi w/0.013W/BTUH fan		
Application	Refrigerator		
Defrost Method	Air		
Recommended Defrosts per Day	0		
Adaptive Defrost Available	No		
Frost Load Test Run	No		
Steady State Refrigeration Capacity	$q_{ss} (90^{\circ}F) (Btu/h)$	3892	From test
Steady State Power Consumption	$E_{ss} (90^{\circ}F) (W)$	628.69	From test
On-cycle evaporator fan power	$EF_{comp,on} (W)$	51	From test
Off-cycle evaporator fan power	$EF_{comp,off} (W)$	10.12	From test
Dry Coil Defrost Cycle Energy Input	$DF_d (W-h)$	0	From test
Frost Coil Defrost Cycle Energy Input	$DF_f (W-h)$	0	From test
Gross Refrigeration Capacity	$q_{mix,avg} (90^{\circ}F) (Btu/h)$	4065	AHRI 1250P-2009 [106]
Frost Coil Defrost Cycle Energy Input	$DF_f (W-h)$	0	10 CFR 431.304(c)(10)(ix)
Number of Defrosts per Day	N_{DF}	0.0	10 CFR 431.304(c)(10)(ix) & (x) & (xii)
Daily Defrost Energy	$DF (W-h)$	0	AHRI 1250P-2009 [C13] & 10 CFR 431.304(c)(10)(xii)
Daily Defrost Heat Load Contribution	$Q_{DF} (Btu)$	0	10 CFR 431.304(c)(10)(xi) & 10 CFR 431.304(c)(10)(xii)
Defrost Power Consumption	$DFdot (W)$	0	AHRI 1250P-2009 [C15]
Defrost Power Consumption Contributed to Box Load	$Q_{DFdot} (Btu/h)$	0	AHRI 1250P-2009 [C16]
Box Load High	$BLH (Btu/h)$	2724	AHRI 1250P-2009 [1] or [5]
Box Load Low	$BLL (Btu/h)$	389	AHRI 1250P-2009 [2] or [6]
Load Factor High	LFH	0.70	AHRI 1250P-2009 [97]
Load Factor Low	LFL	0.11	AHRI 1250P-2009 [98]
Box Load Sum	$BL (Btu)$	1.0E+07	AHRI 1250P-2009 [16]
Power Consumption Sum	$E (W-h)$	1.7E+06	AHRI 1250P-2009 [17]
	AWEF (Btu/Wh)	5.85	AHRI 1250P-2009 [15] or [99]
	Class	DC.M.I.	
	Minimum AWEF (Btu/Wh)	5.61	10 CFR 431.306(e)
	Meets Requirements	Yes	
Notes: Values in [xx] refer to equation numbers in AHRI 1250. In general, these calculations are described in 7.4 & 7.7.			
DOE-AHRI 1250 Calculator Full (04-08-15).xlsx		DC.x.I (MATCH)	
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- III. The ratios of the two AWEF calculations is: $4.01/5.85 = 0.685$

Recommendation: AWEF correction factor for fans: $FAN_{CF} = 0.685$

Conclusion for Technical Justifications Section:

Combining the results from sections 1, 2, and 3 above results in a final recommended AWEF correction factor to support the requested 0.55 correction factor to the final AWEF calculation:

$Run\ Time\ CF * Compressor\ CF * Fan\ CF = 0.950 \times 0.835 \times 0.685 = 0.543$, which is approximately equal to the 0.55 K factor (DOE Direct Final Rule EERE-2011-BT-STD-0043-0122).

Success of the application for Interim Waiver will:

Success of the application for Interim Waiver will ensure that manufacturers of wine cellar cooling systems can continue to participate in the market.

What economic hardship and/or competitive disadvantage is likely to result absent a favorable determination on the Application for Interim Waiver

If existing CellarPro products were altered in order to test per current requirements set forth in 10 CFR 431.304 and AHRI 1250, the economic hardship will be loss of sales due to not being able to meet the DOE energy conservation standards set forth in 10 CFR 431.306 due to the technical and application constraints described in this document.

Regards,

Date: 10/2/20

/s/

Keith Sedwick

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Owner

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